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Site: Peak: 3.9

Olin CHEMICALS
P.O. BOX 248, LOWER RIVER ROAD, CHARLESTON, TN 37310
PHONE: (615) 336-4000

20373

April 25, 1991

VIA FEDERAL EXPRESS

Cheryl Walker Smith
Senior Remedial Project Manager
United States Environmental Protection Agency
345 Courtland Street Northeast
Atlanta, Georgia 30365

SOUTH SUPERFUND REMEDIAL BRANCH
APR 26 1 23 PM '91

Re: Outline of Response to EPA Comments 4/3/91 on RI/FS Work Plan
Olin Chemicals/McIntosh Plant Site
McIntosh, Alabama

Dear Ms. Smith:

Olin's draft response to EPA's comments on the RI/FS Work Plan submitted December 15, 1990, is attached. Our intention with this response is to provide EPA information as to how we will revise the Work Plan to satisfy EPA's comments of April 3rd. To that end, we have attempted to reflect our understanding of the discussion during our April 11th meeting relative to these comments. We hope this document can serve as the basis for resolving all these issues at our April 29th meeting in Atlanta.

Justification for Extension of Time to Resubmit Work Plan

As you pointed out in your letter of April 3rd, the AOC provides 30 days for Olin to revise a document that EPA has disapproved. This 30-day period for the Work Plan will expire on May 6, 1991. We discussed the need for an extension at our April 11, 1991, meeting. Olin believes that an extension is justified for the following reasons:

The issues raised by EPA regarding the Work Plan were very complex and have required more time than would normally be expected to refine elements of a Work Plan prepared under an approved Scope of Work. EPA offered to meet to discuss their comments. Olin agreed that this would help us understand EPA's reasoning behind the more complex issues. This meeting was held April 11, seven days into the 30-day period. While we used those seven days to craft a response to those comments that simply required refining the Work Plan, we could not adequately address the more complex (and therefore, more time consuming) issues until we understood EPA's expectations.

Several issues were raised that Olin believes are outside the approved Scope of Work and therefore constitute additional tasks under the AOC. These tasks were raised, in part, by agencies other than EPA, such as FWS and NOAA. While we understand that CERCLA vests these agencies with certain responsibilities, they were not involved in the Scope negotiations to the extent EPA was. Because these tasks were not discussed during the scope negotiations, the foundation, framework, details, and resolution must be discussed together at this time. This more intensive discussion naturally takes more time than resolving issues whose boundaries have been established under the scope. These additional tasks mostly involve ecological assessing and modeling studies, including the Tombigbee River. Olin has notified EPA (Letter of April 18, 1991, R. A. Pettigrew to C. W. Smith) that these issues will have to be addressed by dispute resolution under the AOC if a final agreement cannot be reached by negotiation. While we believe that the issues can ultimately be resolved by negotiation, resolution and incorporation into the Work Plan will obviously take longer than 30 days.

Both EPA and Olin want the Work Plan approved without multiple submissions and comments. Given the complex nature of the issues raised by EPA's comments, it is prudent to take sufficient time to insure that Olin understands EPA's expectations and that EPA understands and concurs with the basis for Olin's revision of the Work Plan. With the meetings and conference calls held and planned, it has become clear that 30 days is insufficient to communicate sufficiently to insure an approvable Work Plan with the next revision.

We have made progress towards resolving the issues raised in the comments. However, we do not expect to resolve them finally until our meeting on April 29, 1991. The complex issues are also the issues that will require the most revision to the Work Plan. We expect that it will take approximately 30 days to revise, edit, and publish the amended Work Plan.

For the reasons outlined above, Olin requests that EPA extend the resubmission date of the Work Plan to May 27, 1991.

Notes Regarding the Attached Response

We have structured the response using the same numbering system as your April 3rd comments. If a response states that the comment will be incorporated into the amended Work Plan, we intend to address that comment exactly as EPA suggested. For more complex comments, our response may be a mixture of how we plan to amend the Work Plan and how we see the issue. These are the responses that we expect to resolve at our April 29th meeting.

We have referred to the Work Plan submitted December 15, 1990, as "the Work Plan" using past tense. The revision of the Work Plan to be submitted in May is referred to as "the amended Work Plan" using future tense. I hope this helps

clarify when we are discussing plans already made and presented to EPA and when we are discussing revisions based on EPA's comments.

Please let me know if you have any questions regarding the contents of this response.

Sincerely,

OLIN CORPORATION

J. C. Brown
Manager, Environmental Affairs

jmm
Enclosure

cc: W. A. Beal (Sent from WCC with response)
D. E. Cooper (Sent from WCC with response)
M. S. Davenport (without attachment)
W. J. Derocher (Sent from WCC with response)
Pete Douglas (Sent from WCC with response)
Joe Downey (Sent from WCC with response)
M. L. Fries (Sent from WCC with response)
W. G. McGlasson (without attachment)
Danny Moore (Sent from WCC with response)
T. B. Odom (Sent from WCC with response)
R. A. Pettigrew (Sent from WCC with response)

RESPONSES TO EPA COMMENTS OF APRIL 3, 1991 OLIN MCINTOSH RI/FS WORK PLAN

COVER LETTER

In response to the EPA comments regarding schedule, Olin will overlap tasks (e.g. Feasibility Study and RI activities) to facilitate an earlier completion. To meet the expectation of an 18-month time frame will require a reduction in some EPA response times, particularly with regard to approval of the technical memoranda. In addition, this schedule will require that all basin field activities be completed during the non-flood season of 1991 (approximately June to December).

The amended Work Plan will include projected start dates and end dates as well as durations for each task.

GENERAL COMMENTS

1. Olin does not contend that the soil contamination within OU-1 has been defined to the extent that there have been complete CLP or Appendix VIII analyses of all areas with potential soil contamination to the total depth of the contaminated zones. Olin believes that the major issue regarding soils relates to the potential for contaminated soils to act as a continuing source. Olin has identified potential source areas that may have associated soils contamination. These include SWMUs that were regulated under 40 CFR 264, SWMUs not regulated under 40 CFR 264 and areas that are not classified as SWMUs (e.g., the CPC plant, the mercury cell plant). The RI/FS Work Plan described these potential source areas in the initial evaluation section. Olin has implemented a series of closure and removal activities to control future releases from these potential source areas, including nine clean closures. As part of the Post-Closure permit for the facility, Olin continues to monitor groundwater around these areas.

   To evaluate whether there are contaminated soil areas that act as continuing, significant sources (e.g., sources that continue to contribute to groundwater

contamination) Olin has proposed in the RI/FS Work Plan to review the groundwater analytical data (Section 5.3.2.6 of the Work Plan). Olin's Post-Closure RCRA permit (September 1986, modified in September 1988) requires a compliance monitoring program and a corrective action monitoring program at the facility. Olin samples a total of 37 monitor wells on a quarterly basis. Historical trends in the quarterly monitor well data will be evaluated by plotting time vs. concentration graphs (clean-up curves) for each of the 37 wells, and isoconcentration maps will be generated for each quarterly monitoring event. The approach is that if significant continuing sources do exist, the presence of these sources should be reflected in the groundwater data, either in the lateral distribution (i.e. the plume is not diminishing as was predicted in the modeling efforts) or the clean-up curves show an increasing or non-diminishing trend. After review of this monitor well data, Olin will submit the results to EPA in a technical memorandum (source evaluation).

As part of the RI/FS (Section 5.3.2.5 of the Work Plan), Olin will prepare a clean closure equivalency demonstration to show that past clean closures under 40 CFR 265 are equivalent to 40 CFR 264 closures. The clean closure demonstration will be prepared based on the guidance provided to Olin in an EPA memorandum dated May 12, 1989. Any additional soils data that will be required to complete this demonstration will be collected during the RI/FS.

In addition, Olin will review historical aerial photographs and topographic maps for an indication of other potential source areas that may require investigation. The review of historical aerial photographs will be incorporated into the Source Evaluation Technical Memorandum; any additional soils investigation that may be warranted as a result of this review will be outlined in a revised Sampling and Analysis Plan.

2. Extensive investigations and other data collection activities have been conducted at the Olin McIntosh facility, primarily through the RCRA programs and other voluntary activities conducted by Olin. As discussed in our meeting April 11, 1991, the extensive data available from the site make it impractical to include all

of the results in the RI/FS Work Plan. These data have been submitted in their entirety to EPA previously in the following documents:

- The seven volume 1989 RI/RA report.
- The closure reports for the various closed and clean closed SWMUs
- The semiannual groundwater monitoring reports.

In response to this comment, Olin will provide in the amended Work Plan, a more thorough summary of soil sampling data particularly with regard to documentation of past closure activities.

3. In response to this comment, the amended Work Plan will include available boring logs for the wells that will be sampled or are sampled as part of the ongoing RCRA groundwater monitoring program. A table will be added to the amended Work Plan that summarizes the well construction information.

4. The purpose of the one-time sampling event is to confirm that past data collected under the RCRA programs are equivalent to data collected under current CERCLA standards. As discussed in the response to General Comment 1, Olin samples and is required to continue to sample, 37 monitor wells quarterly as part of their RCRA Post-Closure monitoring program. This substantial data base (14 sampling events of 37 wells) can be used after the one-time sampling event substantiates it. These past and future quarterly monitoring data will be analyzed and interpreted in the RI/FS, along with the data from the one-time sampling event.

In response to this comment, the amended Work Plan will indicate that the groundwater characterization will include a discussion of a) the occurrence of potential contamination in the Miocene Aquifer, and b) an evaluation of the effectiveness of the current pump and treat system. The amended Work Plan

will further state that groundwater characterization will be conducted by evaluating the data from the one-time sampling event and the quarterly sampling results. A map will be added showing the locations of all the monitor wells at the facility and indicate which of these wells are sampled quarterly.

The Work Plan did make provisions for additional sampling beyond the one-time sampling event (Section 5.3.2.8).

5. The data presented in the 1989 RI/RA did show variations in mercury concentrations at the southeastern plume boundary between the 1987 and 1989 data, with higher concentrations in some wells during 1989. The concentrations reported during the two sampling events at the southeastern boundary did not exceed the groundwater protection standard for mercury of 2.0 μg/l (as established in Olin's Post Closure Permit). Olin believes it is more appropriate to compare all available data to make determinations as to plume migration, rather than select only two events. The two events cited by EPA in the comments were presented in the 1989 RI/RA as representative in general, not for every well. In monitor well PL9D, the basis for EPA's comment, the data point of 2.0 μg/l is apparently anomalous since all data before and after that data were BDL to 0.4 μg/l, which is within normal variability and indicates that mercury is at concentrations near or below the detection limit.

It is important to evaluate temporal trends to identify possible "slugs" of contamination or anomalous data. Therefore, Olin proposed in the Work Plan to evaluate the quarterly monitoring data that has been collected since the corrective action program was implemented. In response to this comment, Olin will indicate in the amended Work Plan that all quarterly monitor well data will be used to evaluate the extent of contamination in the Alluvial Aquifer. Olin believes there are a sufficient number of wells, properly located downgradient of all sources to determine the extent of the plume. If the evaluation of all data does not support this, Olin will install additional wells to determine the extent.

6. The statement referred to in EPA/ADEM's comment was quoted in the Work Plan from the AOC (Page 4, IV.G). Because of the extensive review of the AOC by both agencies, Olin thought there was general agreement on this conclusion. In any event, Olin believes that the statement that there is not significant leakage from the Alluvial Aquifer to the Miocene is valid. The extensive stratigraphic information available from the site indicates that the low-permeability clay aquitard between the Alluvial Aquifer and the Miocene Aquifer is continuous across the site with an average thickness of 100 feet.

   The Work Plan presented plans to sample three wells screened in the Miocene and conduct chemical analyses of these samples to assess whether there has been any significant contaminant leakage. The plan will be amended to include a summary and discussion of past Miocene groundwater contaminant concentration data. The Miocene sampling is described in more detail in the response to Work Plan Comment 10.

   Olin believes that recharge to the Miocene by direct infiltration through surficial deposits does not occur in the vicinity of the McIntosh Plant. Rather, recharge is generally believed to be updip of the facility where the Miocene strata outcrop west and northwest of the town of McIntosh. Olin is interested in any additional references that EPA may be aware of that would indicate that there is significance recharge by downward percolation in the vicinity of the Olin facility.

7. A map showing the locations of all monitor wells and corrective action wells will be provided, as discussed in the response to General Comment 4. In addition, Olin will provide summary tables showing the results of the soil sampling that was conducted for the SWMU closure activities. Due to the extensive sampling data that have been obtained from the facility, Olin believes that it is impractical to include all past sampling locations in all media (see response to General Comment 2).

8. Olin will obtain potentiometric data from Miocene monitor wells DH-1 and DH-3. Monitor well DH-2 was installed in a zone initially thought to be the

Miocene Aquifer. However, a subsequent review of the boring data indicated that this well is actually screened in clay and sand strata above the sand of the Miocene Aquifer. A copy of the DH-2 boring log is included at Attachment A. Olin will also obtain potentiometric data from the Miocene process water wells. It should be noted, however, that up to three of these process water wells are actively pumping at a time, and the data from the pumping wells will not reflect static potentiometric elevations.

9. See responses to General Comments 1, 4 and 5 regarding the evaluation of the groundwater data during the RI/FS. The data requested by this comment has been submitted in the documents referred to in the response to General Comment 2. Olin believes that it is impractical to submit this data in its entirety with the RI/FS Work Plan. In our April meeting, EPA Superfund requested, and Olin will submit the semi-annual reports, which support the corrective action program.

10. These concerns regarding the ecological studies are addressed in the responses to General Comments 22 through 28.

11. The basin is a well-defined topographic/hydrographic (and hence, ecological) feature whose boundary constitutes a logical limit for initial phases of study. The Field Sampling Plan (Figure 5) showed the planned sample locations in the basin area, including two samples along the discharge ditch leading from the basin to the Tombigbee River. One of these samples is planned at the approximate intersection of this discharge ditch and Olin's property boundary. It's exact location will be determined in the field with EPA's concurrence. Olin has made a commitment to evaluate the basin first, and evaluate potential pathways offsite, including the Tombigbee River. Olin will present the results of the basin investigation in the Preliminary Site Characterization Summary. Olin is further committed under this RI/FS to delineate the lateral and vertical extent of contamination. If the extent of contamination has not been determined by the investigation of the basin area, Olin will extend the investigation in the direction(s) in which additional data are required. Olin will more clearly state

in the amended Work Plan that an additional phase of investigation will be conducted if the lateral and vertical extent of contamination is not defined by the planned activities. Further, the amended Work Plan will state that the details of any subsequent phase of investigation will be included in a revised Sampling and Analysis Plan.

12. Olin has existing monitor wells around the sanitary landfill (SL-1, SL-2, and SL-3, SL-4). In response to this comment, Olin proposes to sample SL-2, SL-3 and SL-4 (SL-1 has been decommissioned) during the one-time sampling event. The locations of these wells in relation to the sanitary landfills will be shown on a map and available boring log data and well construction information will be provided in the amended Work Plan.

13. The level of detail for the various sampling activities will be made to be more consistent in the amended Work Plan.

14. A list of references will be included in the amended QAPP.

15. The 1990 U.S. EPA Contract Laboratory Program (CLP) Statement of Work (SOW) will be included in the references to the methods to be employed.

16. This comment will be incorporated into the amended Work Plan

17. This comment will be incorporated into the amended Work Plan.

18-21. Olin appreciates the comments on the Health and Safety Plan (HSP). These comments will be taken into consideration when developing the final HSP.

22. See response to comment 11.

23. Olin will use CLP (DQO Level IV) analytical procedures for all confirmatory analyses of the surface water and sediment. These procedures have established Contract Required Quantification Limits, which are listed in the QAPP. For

analysis of risk, the methods for evaluating constituents that are reported below the detection limit will be based on current EPA guidelines (Risk Assessment Guidance for Superfund: Volume 1 - Human Health Evaluation Manual, 1989, EPA/540/1-89/002, RAGS). Olin will propose in the amended Work Plan the use of field screening procedures (DQO Level II) to insure a productive and timely field program.

24. Aquatic biological sampling cannot begin until details of the bathymetry of the basin and the distribution of contaminants in sediments are established to provide for a better informed determination of sampling locations. The bathymetric survey will be initiated as soon as water in the basin has receded to nonflood levels, assuming that the amended Work Plan is approved. The biological sampling will be confined to the nonflood period, during which the basin is semi-isolated, for the following reasons:

1) With less water and turbulence (i.e., less dilution/dispersion) the likelihood of encountering "worst-case" contaminant concentrations increases.

2) With shallower and less turbulent water, sampling will be more efficient (e.g., lower turbidity enhances electrofishing success).

3) Conditions will be less hazardous for personnel.

A truly "comprehensive" survey of the biota of the basin is unnecessary for RI/FS purposes and would require efforts (and time) substantially exceeding those recommended in guidance documents (EPA 1989; Hicks et al. 1989).

The sampling already proposed will provide for a detailed characterization of the macrophyte and aquatic macroinvertebrate communities of the basin under nonflood conditions. Thus, the amended Work Plan will indicate that the basic information on taxonomy and numbers of individual plants and benthic macroinvertebrates observed or collected per unit of effort will be reported as

well as the resulting indices calculated for use in comparisons. Similarly, the identities and catches/effort of fishes taken during sampling for tissues will be recorded to provide information on the structure of basin fish communities under nonflood conditions. A formal wetlands delineation is unnecessary because virtually all of OU-2 except the open reaches of permanent water bodies presumably constitutes a wetland.

The requested comparisons of biotic community structure to "expected abundances and composition in general" is perplexing. The proposed approach of comparing biotic community indices for contaminated areas with those of selected reference (control) areas is recognized by EPA (1989). If there were a detailed baseline characterization of the nekton and benthos (derived from comparable sampling methods) in a pristine lower Tombigbee River floodplain lake, it would provide a basis for meaningful comparison. In the absence of such a documented baseline, use of nearby reference areas is the only scientifically defensible approach.

25. Olin agrees that separate processing of individual benthic grab samples (replicates) is preferable to compositing. Three replicate grabs will be collected and processed individually at each station to provide a basis for statistical analysis of variability within and among locations. Field and laboratory processing of individual benthic grabs will be somewhat more time-consuming than the compositing approach initially proposed. Sampling in triplicate provides for reasonable estimation of variability and is a commonly used level of effort. Moreover, it is anticipated that sediments will be relatively homogeneous in a given location in a lentic environment, such as the basin (i.e., versus a stream).

In response to this comment, the macroinvertebrate sampling discussion in the amended Field Sampling Plan will be changed to indicate that three replicate grab samples will be collected. In addition, the discussion will further indicate that detailed sediment descriptions will be made during sample collection and these descriptions will be noted in the field log book.

26. Phase I "characterization of the basin" and Phase II "biological sampling" are both part of the RI proper. Designation of the fish sampling as a Phase II task was based on the need for completion of sediment and surface water analyses to provide for a better-informed basis for selection of the biological sampling locations. The response to General Comment 28 describes the criteria used for selecting fish species for tissue analysis. These criteria take into account both human health and ecological considerations.

27. In the April 16th conference call, EPA agreed with Olin that an "ecological risk model" as described in this comment was beyond the scope of an RI/FS. To outline Olin's position, the "ecological risk model" envisioned in this and the following comment substantially expands the scope of effort beyond that agreed upon in the AOC as well as that described as adequate in guidance manuals (e.g., EPA 1989). The agreed-upon Scope of Work and the Work Plan committed to addressing the considerations listed in Comment 27 in a descriptive or conceptual context, and further suggest that models may be used to assist in interpretation of the data. Detailed predictive (quantitative) ecological models are extremely complex, require extensive and accurate data, and typically provide unreliable results. The RI report will include an estimation of contaminant fate and transport, but estimation of the "net export of mercury" to the river would involve some type of static mass balance or dynamic model capable of accepting varying inputs such as the extremely uncertain details of discharges to the basin. In constructing such a model for an environment as complex (and poorly known) as the basin too many tenuous assumptions would be required to provide a level of confidence in the results that is consistent with the effort. Olin envisions narrower, pathway-specific models which would be identified in consultation with EPA when and if such predictive models appear necessary.

28. The comment begins by recommending addition of another phase (Phase III?) to the RI/FS. As currently planned, the efforts will be very difficult to complete in a time-frame that will support submission of the Draft FS by July 30, 1992, as requested in the EPA letter of April 3, 1991. Of particular concern is the "window" for field work during nonflood conditions, which effectively limits

sampling to six months at best. Therefore, addition of any phase involving another "round" of sampling based on the results of precursor field work is impossible without revising the overall schedule for the RI/FS and significantly delaying its completion.

The additional phase is recommended to incorporate three significant expansions in the scope of the RI/FS (some aspects of which were mentioned in earlier comments):

a. Extra sampling (for contaminant analyses) to encompass additional trophic levels -- i.e., a "food web survey" -- to verify the ecological risk model discussed in Comment 27.

b. Extension of sampling of sediments (and, by implication at least, "food web" tissues) to the river.

c. Assessment of vertical distribution of contaminant concentrations in selected sediments at a 1-centimeter level of resolution.

Food Web Survey. EPA has agreed that the use of a comprehensive ecological risk model is unnecessary as discussed in response to Comment 27. The planned restriction of tissue sampling to fishes likely to represent "worst-case" concentrations will provide a basis for describing or estimating the extent of contamination. In light of the desire for expeditious completion of the RI/FS, it is reasonable to limit the scope to characterizing the extremes and then estimating the potential levels in other components of the food web. To minimize, as much as possible, the confounding factors of migration, Olin plans to sample fish that are less likely to engage in large-scale movements. Accordingly, largemouth bass (Micropterus salmoides) and either yellow or black bullhead (Ictalurus natalis or I. melas) are designated as the preferred species to sample, if available in sufficient quantity. The former is a predacious species which tends to be relatively sedentary (particularly the older, larger individuals). Largemouth bass represent the top of the aquatic "food chain," and provide the

additional advantage of being a favored sportfish. Use of this species will thus provide a good basis for estimation of both ecological and human risk. The bullheads are bottom-dwelling, bottom-feeding omnivores which will provide an excellent indication of the significance of intimate contact (through food ingestion and gill ventilation) with the sediments. Bullheads are believed to be less migratory than other Ictalurus, such as the channel catfish. Although occasionally taken by humans, bullheads provide a particular advantage from the ecological perspective because they are common prey of piscivorous reptiles, birds, and mammals. In the event that reasonable sampling efforts fail to yield the specified minimum number of individuals for each species (20), alternative species will be selected on the basis of the same criteria noted above and in the Work Plan. Possible acceptable alternatives to largemouth bass are envisioned as warmouth (Lepomis gulosus) or black crappie (Pomoxis nigromaculatus).

As discussed in the Work Plan, Olin believes that it is important to analyze tissues as discrete fillets from individual fish. In response to the comment, however, five of the 20 specimens of each species will also be analyzed for "whole-body" concentrations of contaminants. The fish tissue will be analyzed for mercury and the organic indicator parameter(s) as determined by the sediment sampling in Phase I.

River Sampling. See response to General Comment 11.

Discrete-Depth Analyses of Sediments. In response to this portion of the comment, Olin plans to perform a more detailed, stratified analysis of the upper six (6) inches of each of the sediment core samples collected during Phase II (see response to general comment 14). The upper six inches of the sediment should encompass the bioaccessible zone. Olin proposes to subdivide this upper section of the core into three, 2-inch thick segments for separate analyses for mercury and the selected organic indicator parameter(s). Such an approach will provide for adequate characterization of stratification of contaminants for purposes of the RI/FS.

29. EPA, Fish and Wildlife, and NOAA agreed during the April 16, 1991 conference call that it was not their intention to have Olin conduct a Natural Resource Damage Assessment.

All biological sampling was summarized in the Work Plan (Page 7 Paragraph 3). A more complete discussion will be provided in the amended Work Plan.

30. The basin is clearly identified on the maps provided in the Work Plan, along with the OU-2 area (the basin and associated wetlands).

Figure 5 of the Field Sampling Plan showed the planned sediment sampling locations, which are restricted to the basin and do not initially extend to the floodplain area. The EPA comment that deposition of sediments could occur in the floodplain area during flood conditions is valid. However, the known sources of contaminated sediments are from drainageways that emptied into the south part of the basin. From 1951 to 1974, plant wastewater discharge was routed through the wastewater ditch through drainageways to the southern part of the basin. In 1974, the discharge was rerouted directly to the discharge channel to the south of the basin, bypassing the basin itself. Given this historic information, Olin believes that the greatest potential for contamination in the sediments is in the basin, specifically in the southern part of the basin. Therefore, the initial plan to sample the basin sediments and the drainageways into the basin is the appropriate approach for characterization.

As stated in the response to General Comment 11, Olin will present the results of the basin investigation in the Preliminary Site Characterization Summary. If the lateral and vertical extent of contamination has not been determined by the sediment sampling presented in the Work Plan, Olin will extend the investigation in areas where more data are required, which may include other areas within the flood plain. The details of any subsequent sampling phase in the basin will be presented in a revised Sampling and Analysis Plan.

31. Olin proposes to sample for a subset of the Target Analyte List (TAL) that includes the thirteen metals on the Priority Pollutant List (including chromium) and cyanide. The proposed parameters include:

arsenic
cadmium
chromium
lead
mercury
selenium
silver
antimony
beryllium
copper
zinc
thallium
cyanide

Olin believes that this proposed parameter list will adequately characterize the occurrence of potentially hazardous analytes, while excluding those constituents on the TAL that are not considered hazardous, but can be found in varying concentrations naturally in the soils, sediments and groundwater.

SPECIFIC COMMENTS

WORK PLAN

1. These comments will be incorporated into the amended Work Plan.

2. A reference to Figure 2 will be included in this paragraph of the amended Work Plan.

3. There is an extensive amount of data that has been generated from the previous investigations at the facility. It is impractical to present all of the data in the Work Plan. However, in response to the EPA comments, Olin will provide a map showing the locations of all monitor wells at the facility in the amended Work Plan. Olin will also provide tables summarizing the soil testing in the SWMUs and a thorough summary of the 1987 Basin-Investigation results.

4. The statement will be revised in the amended Work Plan to say that the aquitard "inhibits" contaminant migration.

5. See response to General Comment 5.

   The physiographic province was included to describe the regional setting of the facility. Olin believes that the discussion presented is sufficient, and providing a separate figure showing the site relative to the physiographic provinces is not necessary.

6. This unit was not included because the hexachlorobenzene-contaminated soil was removed from the area (a total of 11,407 tons). Confirmation sampling was conducted based on 30 foot by 40 foot grid spacing (a total of 30 sample locations). The confirmation samples showed that removal action met the criteria, and exceeded them in most samples, as established in the Administrative Order of Consent for the Emergency Removal.

7. Two of the ash ponds were incorrectly identified as active on Figure 2. Figure 2 will be corrected in the amended Work Plan.

8. The amended Work Plan will include a table showing the results of sampling that has been conducted in the Miocene wells.

   The cross contamination discussed in the Work Plan is believed to be an isolated occurrence due to insufficient decontamination procedures either during well installation or during sampling. The Miocene monitor wells are double-cased and are not believed to be a continuing source of contamination. The active production water wells will serve to withdraw Miocene groundwater contamination, if any, (see response to Work Plan Comment 10 below). This water is used in the process and discharges through the NPDES permitted outfall.

   If additional Miocene monitor wells are installed during subsequent RI/FS activities, procedures to case off potentially contaminated zones will be followed to prevent cross contamination during well installation and to prevent the creation of pathways for downward contaminant migration. The detailed procedures would be outlined in a revised SAP.

9. As an Appendix to the Work Plan, Olin will provide pre-corrective action and post-corrective action potentiometric maps for the facility. The maps provided will be the extracted from the 1989 RI/RA without modification. The final RI/FS report will include an additional potentiometric map based on data collected during the one time sampling event.

   The misspelling of linear will be corrected in the Work Plan.

10. The interpretation of southwest flow gradients in the Miocene Aquifer is based on the regional groundwater flow patterns in the absence of pumping. Olin has six active process water wells screened in the Miocene, with a minimum of any two pumping at all times. Attachment B of these responses to EPA comments,

includes an evaluation of the effects of pumping from two process water wells, WW8 and WW10 (each pump at 1,000 gpm). This evaluation was conducted with an analytical groundwater model based on the Theis equation. Water wells WW8 and WW10 were selected as a conservative approach because they are the farthest from the facility, and thus would have the least effect at controlling gradients in the plant area. This evaluation shows that pumping these two Miocene wells produces cones of depression that would intercept contamination in the plant area. Therefore, although the regional gradient is believed to be to the southwest, flow within the Olin facility is interpreted to be toward the pumping wells. Based on this analysis, Miocene well(s) installed to the southwest would monitor flow from offsite to onsite. Olin believes it is more appropriate to sample the three Miocene wells listed in the Field Sampling Plan (DH-1, DH-3, and WW-8). The amended Work Plan will indicate that a more thorough evaluation of the effects of pumping the process water wells in the Miocene will be conducted as part of the RI/FS.

11. Chloroform was detected in the groundwater during the investigations conducted in 1981. Olin believes that chloroform is a degradation product of wastes from the trichloroacetonitrile process. The degradation of this waste from the former CPC plant is well documented. Olin produces the same waste at their Rochester, New York facility. The waste is managed by hydrolyzing it under mild hydrolysis conditions to degrade the waste to chloroform. Similar hydrolysis conditions would have existed in the former acid neutralization ponds.

12. The amended Work Plan will indicate that the Weak Brine Pond was "closed."

13. Figure 2 will be changed to indicate that these two SWMUs were clean-closed.

14. A table showing the results of the stormwater pond sampling will be added to the amended Work Plan.

15. The acceptable limits for pH were between 2.0 and 12.5 standard units. The acceptable limit for mercury was 200 μg/l based on EP toxicity analyses. These limits will be stated in the amended Work Plan.

16. Olin believes that the activities proposed in the Work Plan are sufficient to address the western plant groundwater contamination as described below. The data indicate that this slug of contamination is concentrated near monitor well WP-6. The pre-corrective action potentiometric map shows groundwater flow in this area was generally from the WP-6 area toward monitor wells PL-4S and PL-4D (See Figure 4 of the Field Sampling Plan for well locations). Monitor wells WP-6, PL-4S and PL-4D are included in the one-time sampling event. WP-6 and PL-4S are also sampled quarterly for RCRA. Since pumping began with the corrective action program, flow gradients in the area trend toward corrective action well CA-1, which is also in the RCRA quarterly sampling and will be sampled during the one-time sampling event. Nevertheless, Olin is committed to define the lateral extent of contamination in the Alluvial Aquifer, which includes the slug of contamination near WP-6. The results of the one-time sampling as well as the review of the quarterly monitor well data will be presented in the Preliminary Site Characterization Summary, and will specifically address this area. If additional activities are required beyond sampling of the wells described above, these activities will be presented in a revised Sampling and Analysis Plan.

17. The strong brine pond was a process unit, not a waste facility, that was closed at the same time as the weak brine pond. All material was removed from this pond and placed in the weak brine pond at closure. Because it never received waste, this unit is not listed in the AOC as a SWMU. Based on this and the fact that all material was removed, it is therefore not included as part of the RI/FS.

18. Olin will consider release mechanisms such as runoff, dust and volatilization for potentially contaminated soils exposed at the surface. This release mechanism will be included in Figure 4, and other appropriate sections of the amended Work Plan.

19. The semiannual reports will be referenced.

20. Based on this EPA comment, it appears that the Work Plan was not clear in outlining the procedures that will be used to evaluate groundwater contamination in OU-2. The hydraulic interaction between the basin and the groundwater is the major factor controlling whether there is a potential for contamination from basin sediments to infiltrate the groundwater in OU-2. Past potentiometric data indicate that the basin acts as a discharge area during non-flood conditions with flow from the groundwater to the basin. During these periods, there is little potential for contaminant migration out of the basin sediment into the groundwater. However, during periods of the year when the basin is in flood, there may be a groundwater reversal. Olin proposed in the Work Plan to evaluate historic temporal groundwater elevation data and basin elevation data to determine whether flow reversals do occur during flood, and if so, are these reversals significant enough to cause contaminant migration from basin sediment into the groundwater. Olin will present the results of this analysis in the Preliminary Site Characterization Summary and if additional activities are required as a result of this analysis (e.g., additional wells in the basin) these activities will be outlined in a revised Sampling and Analysis Plan. In response to this comment, a more thorough discussion of the data to be collected and the type of analysis to be conducted will be included in the amended Work Plan.

21. This correction will be made in the amended Work Plan.

22. Olin meant to discuss this comment on April 11, but did not. Please clarify its meaning at our April 29th meeting.

23. Olin will incorporate this comment into the amended Work Plan.

24. Olin will incorporate this comment into the amended Work Plan.

25. Olin will incorporate this comment into the amended Work Plan.

26. The Work Plan discussed a hypothetical no-action alternative for OU-1. Olin will address the RCRA permit modifications that would be required to implement this hypothetical alternative.

27. Olin will incorporate this comment into the amended Work Plan.

28. See response to General Comment 1.

29. Page 2 of the Work Plan referenced the constituents that are considered by Olin to be the two most significant based on concentration and frequency of occurrence. The statement on page 55 of the Work Plan referred to a more complete list of the types of compounds that were detected during past investigations at the site.

30. The groundwater contamination that has been reported in the Miocene was at low concentrations, and the validity of these old and limited data is questionable. Additional sampling is proposed in the Work Plan to confirm whether contamination in the Miocene does exist. In response to this comment, the statement will be changed to read "There is documented contamination in the Alluvial Aquifer. Limited data collected six to nine years ago indicate that the Miocene may contain low levels of contamination. Additional data are required to confirm whether contamination exists in the Miocene Aquifer."

31. A map will be added to the amended Work Plan that shows the locations of all monitor wells at the site. Further, the amended Field Sampling Plan will indicate what wells are planned for water elevation measurements.

32. The reference will be added to the amended Work Plan.

33. See responses to General Comment 11 and General Comment 30.

34. This correction will be made in the amended Work Plan.

35. Olin will incorporate this comment into the amended Work Plan.

36. See response to General Comment 1.

37. See response to General Comment 1.

38. See response to General Comment 1.

39. See response to General Comment 31.

40. Based on this comment and the guidance provided to Olin in an EPA memorandum dated May 12, 1989, some constituents may be excluded from the full Appendix VIII and Appendix IX analyses during the clean closure demonstration. In response to this comment Olin has reviewed the constituents and analytical methodologies available for the three parameter lists (Appendix VIII, Appendix IX and CLP). In general Appendix IX is the subset of Appendix VIII, including parameters which are considered experimentally measurable and/or for which analytical standards are available. Therefore, Olin compared the Appendix IX list with the CLP parameters proposed for analysis in the Work Plan. Table 1, which is attached, presents this comparison. Based on a review of Table 1 and knowledge of past site activity, one Appendix IX compound (not on the proposed CLP list) was identified as potentially occurring in the soils/groundwater at the site: pentachloronitrobenzene (PCNB). Therefore, Olin requests that EPA approve the proposed CLP parameter list with the addition of PCNB for any groundwater or soils analyses required for the clean closure demonstrations.

From an analytical standpoint, the proposed CLP list plus PCNB is technically justifiable because (1) analytical methods are established based on available laboratory data and judgment of technical experts, and; (2) analytical methods have been rewritten in standard format subjected to editorial review, extensive revisions, and validated in numerous EPA and contractor laboratories across the

country. These analytical considerations are particularly important because the data will be collected as part of the RI/FS, and are subject to validation.

41. The screening technique will be conducted in a laboratory, which may be a field laboratory. Laboratory instruments will be used. Olin has had success previously in using an onsite field laboratory for analyzing soil samples. In response to this comment, the amended Work Plan will indicate that a laboratory screening technique is planned.

42. The topographic survey by itself will not identify areas of stressed vegetation. The survey will be used to identify topographic features (e.g., drainage ways, depressions etc.) that may affect vegetation. In response to this comment the amended Work Plan will more clearly state how the topographic information will be used in the vegetative stress survey.

43. Olin plans to expand its current Paradox data management system, which includes field sample data, analytical results, water level data, and well construction details, to include all additional data collected during the RI/FS. Tables generated from this data management system were included in the 1989 RI/RA. Additional types of data (e.g., bathymetric survey data, fish sampling data, etc.) will be added to the data management system as they are collected.

44-47. Olin will incorporate these comments into the amended Work Plan.

48. A subtask "definition of area and volume of media for response action" will be added to this section of the amended Work Plan.

49. This paragraph will be modified in the amended Work Plan to include receptors.

50. A bullet "better define remedial alternatives" will be added to the amended Work Plan as a subtask.

Task 7 will be added to the section subtitle.

51. Task 8 will be added to the section subtitle.

52. These comments will be incorporated into the amended Work Plan.

53. Figure 1 will be modified in the amended Work Plan to more clearly show that Union High School is not on Olin property.

54. The active and inactive ash ponds will be differentiated in the amended Work Plan.

The basin and wetlands area is not fenced, although access is difficult. The only roads into this area pass through Olin's or Ciba-Geigy's plants, which are fenced. Anyone attempting access on foot would have to cross Olin's or Ciba-Geigy's wastewater ditch. Access by boat is possible.

The labeling CLOSED was used for former operating areas where the plant equipment was removed, buildings were demolished, and a cover (clay, concrete, or asphalt) was placed over the area. This labeling will be revised in the amended Work Plan.

55. Figure 5 will be modified in response to this comment.

56. The sources of these documents will be listed on the figures in the amended Work Plan.

57. Figure 11 will be modified in response these comments.

58. Since the Baseline Risk Assessment is part of the RI it was shown to extend until submittal of the RI report.

59. In response to this comment the Feasibility Study will be started earlier. Adjustments to the schedule are discussed in more detail in the response to the cover letter response.

60. Appendix A will be modified to include the biological personnel that will work on the project.

FIELD SAMPLING PLAN

1. This information will be added to the amended FSP.

2. See response to General Comment 6.

3. This section will be modified if any additional sampling objectives are added to the Work Plan.

4. See responses to General Comments 1 and 2.

   The statement on line 3 of the FSP will be changed to read "There is documented contamination in the Alluvial Aquifer. Limited data collected six to nine years ago indicate that the Miocene may contain low levels of contamination. Additional data are required to confirm whether contamination exists in the Miocene Aquifer."

5. The SOPQAM will be referenced in this paragraph.

6. A reference to the figure showing the well locations will be added to this paragraph.

   In response to this comment, monitor wells PL9D and PL9S will be added to the one-time sampling event. Other monitor wells in the southeast (PL8S, PL10S and PL10D) are sampled as part of the quarterly RCRA sampling. As described in the response to General Comment 5, Olin will indicate in the amended Work Plan that the data from the one time sampling event and quarterly monitor well data will be used to evaluate the extent of contamination in the Alluvial Aquifer.

7. See response to Work Plan Comment 10.

8. As part of the requirement for the Post Closure Permit, Olin samples 37 monitor wells on a quarterly basis. The purpose of the one-time sampling is to confirm that past data collected under the RCRA programs (including the quarterly monitoring data) are equivalent to data collected under more stringent CERCLA standards. The quarterly monitor well data in addition to data that are collected during the one-time sampling event will be used to characterize the groundwater contamination in the RI/FS. In response to this comment and other comments regarding the adequacy of the groundwater monitoring, Olin will include in the amended Work Plan/FSP a map showing the locations of all monitor wells in relation to the SWMUs and indicate which of the wells are sampled quarterly for the Post Closure Permit.

9. A map showing the locations of all monitor wells at the site will be provided in the amended Work Plan/FSP.

10. Details from this section will be moved to Section 4.2.2

11. There is was error in the legend of Figure 5. It will be corrected in the amended FSP. Olin plans to collect surficial samples from approximately 62 locations, as shown by the dots on the sampling grid. Olin will collect selected core samples at the same time as the surficial samples. The selection of core locations will be revised based on EPA's comments as described below in the response to Field Sampling Plan Comment 14. Olin is committed to evaluate the horizontal and vertical extent of contamination. Olin will present the results of the basin investigation in the Preliminary Site Characterization Summary. If the lateral and vertical extent of contamination has not been determined by this investigation of the basin area, Olin will extend the investigation in the direction(s) (vertical and/or horizontal) required.

    The holding times are discussed in the response to QAPP Comment 9.

12. See response to Work Plan Comment 42.

13. The sentence will be changed to read "As agreed to in the Scope of Work, a one-time sampling of Alluvial Aquifer monitor wells, Alluvial Aquifer corrective action wells, Miocene monitor wells and Miocene water supply wells will be conducted. . ."

14. Based on the EPA comments, Olin reevaluated the sediment sampling program that was presented in the Field Sampling Plan. EPA raises some valid points, particularly with regard to being able to determine the appropriate locations for the core sampling. The amended FSP will present the details of a sediment sampling plan that will generally include the following:

- Phase I sampling will include collecting surface sediment samples at the grid locations that were shown in Figure 5 of the FSP. In addition cores will be collected at three locations (the two locations with the highest mercury concentrations, and the one location with the highest organics concentrations from the 1987 sampling). All samples will be refrigerated, and protected from light.

- Mercury analyses will be conducted of all grid samples and core samples (at appropriate 6-inch intervals).

- CLP analyses (TCL constituents plus the proposed subset of the TAL parameters) will be conducted at one foot intervals in the core samples.

- CLP analyses (TCL constituents plus the proposed subset of the TAL parameters) will be conducted of randomly selected grid sample locations (approximately twenty percent of the grid samples will be analyzed for the CLP parameters).

- Based on the data from the CLP analyses, organic indicator parameter(s) will be determined. A laboratory screening technique willLbe developed to analyze for the organic indicator parameters.

- All grid samples and core samples (at approximately 6-inch intervals) will be analyzed for the organic indicator parameters. (Note that this plan requires holding these samples (refrigerated) for approximately two months. Olin believes this is acceptable based on the stability of the chlorinated benzenes, which are expected to be the indicator parameters based on the 1987 results. See QAPP Comment 9.)

- Phase II sediment sampling:

  - Additional cores in the basin and/or drainageways at up to up to five locations. The locations and vertical intervals within the core will be based on the results of the Phase I samples.

  - Discrete-depth analysis in the bioaccessible zone at areas determined by the Phase I sampling. The discrete-depth analysis is described in the response to General Comment 28.

The Phase II samples will be analyzed for mercury and the organic indicator parameter(s) as determined by the Phase I sampling. The organic indicator parameters in these Phase II samples will be determined using an analytical method that has detection limits equivalent to CLP.

The program outlined above is to characterize the sediment contamination in the Basin. As described in the response to General Comment 11, any additional sampling required beyond the limits of the basin would be outlined in a revised Sampling and Analysis Plan which would be developed after the Phase II activities.

15. Details will be added regarding the criteria for determining the frequency and location of sampling. However, the specific biological sampling procedures will be determined after the basin characterization (Phase I) is completed. See response to General Comment 24.

16. This correction will be made in the FSP.

17. Wells in the Miocene are included in these measurements.

18-22. These comments will be incorporated into the Work Plan.

23. Only stainless steel soil sampling tools will be used, and the FSP will be changed to reflect this.

24. This comment will be incorporated into the Work Plan.

25. The amended FSP will indicate that the log book must be bound.

26. The amended FSP will indicate that the surface water samples will be analyzed for the parameters outlined in Table 1 of the QAPP.

27. P. 38, Paragraph 2:
The amended Work Plan will reflect the commenter's preferred spelling of "Releve'." A review of various plant ecology references (including Hicks et al. 1989, p. 8-46, on which the SAP was based) indicates that "Relevee" is also acceptable.

In response to the comment, the term "representative site" will be defined as either a normally vegetated or apparently stressed area.

P. 38, Paragraph 3:
In response to the comment, the phrase will be revised to read, "vegetational types."

P. 38, Paragraph 4:
In response to the comment, the section will be revised to indicate that Stratified Random Position is the approach intended for locating sampling stations (i.e., random within vertical strata). This approach was chosen because it is recommended in Hicks et al. (1989, p.8-49).

28. As stated is Section 3.1.1 "The fish sampling procedures will be included in the revised SAP.

29. The number of stations is as yet unspecified because of the intent to base the decision on both distribution and quantity of stations on bathymetry and sediment contaminant concentrations.

30. The term "washing" of samples refers to gentle rinsing with basin or tap water to remove extraneous debris and sediment. This is a common and accepted practice in invertebrate sampling.

31. See response to Field Sampling Plan Comment 18.

32. The field decontamination procedures outlined in this comment will be added to the FSP. These procedures will be used for all equipment that comes in direct contact with the samples.

33. Disposal methods cannot be determined at this time. The methods of disposal will be dependent on the volumes and types of material generated (i.e., liquid, soil, debris, etc.) and the concentrations of constituents in the material. Disposal will comply with all applicable local, state and federal regulations.

34. The locations of the residential wells will be determined by the domestic well survey.

As stated on page 19, WP9A and PE3D are the designated upgradient background wells for the Alluvial Aquifer.

35. The background sediment sampling location will be added to Figure 5 in the amended FSP.

QAPP

1-2. Table 2 of the SAP and Table 8 of the QAPP will be made consistent and incorporate QAPP Comment 2 regarding preservation with HCL.

3-4. These comments will be incorporated into the amended QAPP.

5. HCB will be defined in the amended QAPP.

All six brine wells listed in this paragraph are now closed.

6. See response to Work Plan Comment 7.

7. The QAPP will be modified to indicate which SWMUs were clean closed.

8. This section will be modified to incorporate this comment.

9. The response to FSP Comment 14 above provides an outline of the revised sediment sampling procedures that will be proposed in the amended Work Plan. Using these procedures, the holding times for the mercury and CLP analyses will not be exceeded. Olin does not propose to use methods other than CLP for volatile organic analysis (VOA). Therefore the VOA holding times will not be exceeded. The existing data and knowledge of the site and past chemical data from basin sediments indicates that the probable organics to be used for indicator parameter(s) in the sediments are generally not sensitive to holding times (e.g., hexachlorobenzene). In any event, Olin does not propose to exceed a holding time of 60 days for any of the samples.

10-13. The Work Plan will be modified to incorporate these comments

14. EPA protocols will be referenced.

The amended Work Plan will indicate the specific sampling method to be used for each of the wells that are to be sampled during the one time sampling event. Olin plans to use the following sampling methods for the monitor wells:

- Dedicated or decontaminated teflon bailers,
- Dedicated teflon bladder pumps, and
- Dedicated or decontaminated stainless steel centrifugal submersible (for decontaminated equipment, equipment blanks are run to document the effectiveness of the decontamination procedures)

Olin believes that these methods will yield representative groundwater samples. EPA has indicated concern over the use of centrifugal pumps for groundwater sampling due to agitation, and the potential for a change in volatile concentrations due to pressure differentials during pumping. This is a valid concern which Olin shares. However, Olin installed dedicated pumps in wells sampled under the RCRA program to optimize sampling resources. Teflon bladder pumps are installed in shallow wells and stainless steel centrifugal pumps are installed in deep wells. Olin would have preferred to avoid centrifugal pumps, but the bladder pumps could not provide the necessary pressures and flow rates in the deeper wells. Because of our concern about loss of volatiles, Olin compared data for VOA results from samples collected from the same monitoring well by bailer and by centrifugal pump. These data indicated that the two sampling methods provided equivalent results. Olin believes this is because the centrifugal pumps at the McIntosh site remain completely submerged during the sampling, and the discharge pipe, which generally is greater that 35 feet long, is completely full during pumping (e.g., not exposed to the air).

This sampling protocol is approved under our RCRA Post Closure permit. We ask that it be approved under this Work Plan because:

- One purpose of the one-time sampling is to demonstrate the usefulness of the quarterly monitoring database for RI/FS purpose;

- Results have been shown to be equivalent; and

- It would be difficult to remove dedicated pumps to bail these wells.

The corrective action and onsite water wells have permanently mounted pumps. The details (construction, specifications, pumping equipment, etc.) of the offsite domestic water wells are not known. To use EPA monitor well sampling methods for these pumping wells would not yield data equivalent to sampling from the monitor wells, because these wells were not constructed nor are they operated as monitor wells. This does not mean, however, that the corrective action wells and water wells will not produce useful data. On the contrary, the sampled groundwater is more likely to be representative of a larger section of the aquifer than water sampled from the monitor wells. Olin believes that this useful data should be obtained, and any potential error that may be introduced by sampling methods can be considered when analyzing the data.

The well construction details and the options available for sampling the offsite domestic water wells are not known at this time. However, it is unreasonable to restrict sampling methods for these wells to only EPA recognized procedures for sampling monitor wells.

15. See response to FSP Comment 26.

16. The material presented in Section 5.0 of the QAPP indicates that chain of custody will be maintained. Details beyond the description provided can only be determined after selection of the analytical laboratory.

17. The frequency of calibration will be in accordance with the manufacturer's recommendations.

18. This comment will be incorporated into the Work Plan.

19. Mercury-in-glass thermometers with calibrations traceable to NIST are commercially available. As glass thermometers are easily broken, it is customary to calibrate other thermometers against the NIST-traceable thermometer and to use the secondary thermometers for subsequent measurements. The Work Plan will be revised to indicate that the secondary thermometers traceable to an NIST traceable thermometer will be used for all field temperature measurements.

20. This comment will be incorporated into the Work Plan.

21. This comment will be incorporated into the Work Plan.

22. The reference to CLP SOW's will be added.

23. Table 13 of the QAPP identified the two CLP SOWs that are proposed as the principal protocols to be utilized for the analytical determination and reporting for the bulk of all the parameters. Page 52, Section 8.0 of the QAPP identifies the two CLP Functional Guidelines that are proposed as the principal protocols to be utilized for data validation for the bulk of all the parameters. These two documents provide explicit specifications for acceptance, qualification, and rejection of data. In response to this comment, the amended QAPP will provide an organizational chart showing the personnel or titles of personnel who are responsible for the data review and validation process.

    The statement concerning thermal drying of samples with high volatile organic content to obtain percent moisture content is rigorously technically correct. For samples with high volatile organic content thermal drying overnight at 105° C provides the potential for driving off substantial quantities of organic material in addition to the water. If the percent moisture determination is biased high, then all concentrations reported on a dry weight basis will be biased high. Olin does not propose that organic parameters be determined on thermally dried samples.

24. All CLP analytical data will be validated.

25. Table 1 of the FSP will be included in the amended QAPP.

Olin is unable to predict whether EPA will require split samples and if so the nature or frequency of such split samples. It is not proposed that samples be spiked in the field nor that control charts be employed for either split samples or field spiked samples.

26. The quality control specifications presented throughout the two proposed CLP SOWs are performance oriented. As long as the quality control specifications are met, routine maintenance is normally not scheduled. The frequency of the mandatory quality control determinations and the necessity of satisfying the associated stringent performance specifications, precludes the probability of unknowingly obtaining noncompliant data.

27. The two proposed SOWs and two proposed Functional guidelines provide thorough coverage of QA limits and data acceptability limits. With the referencing of these EPA documents, further discussion seems inappropriate.

"Any project individual who observes a major problem" is deemed a responsible individual. Figure 10 titled Quality Assurance: Corrective Action Request Form required that the QA Officer must review and sign off on any recommended corrective action as well as any completed corrective action.

Page 69, Section 13.0 of the QAPP enumerated the steps that lead to a corrective action.

"The corrective action entails the following:

- Definition of the problem.
- Assignment of responsibility for investigating the problem as necessary.

- Investigation and determination of the cause of the problem as necessary.
- Determination of the corrective action to eliminate the problem as necessary.
- Assignment of responsibility for implementing the corrective action.
- Verification that the corrective action has eliminated the problem."

These details will be included in the amended QAPP.

28 This comment will be incorporated into the amended QAPP.

29. These corrections will be made to Table 8.

30. See responses to Work Plan specific comments 51 and 52.

HEALTH AND SAFETY PLAN

1-9. Olin appreciates the comments on the Health and Safety Plan (HSP). These comments will be taken into consideration when developing the final HSP.

REFERENCES

EPA 1989. Risk assessment guidance for Superfund. Volume II. Environmental Evaluation Manual, Interim Final. U. S. Environmental Protection Agency, Washington, D. C., EPA/504/1-89/001.

Hicks, W. W., B. R. Parkhurst, and S. S. Baker, Jr. (editors). 1989. Ecological assessment of hazardous waste sites: a field and laboratory reference. U. S. Environmental Protection Agency, Corvallis, OR, EPA/600/3-89/013.

TABLE 1

APPENDIX IX - PROPOSED CLP PARAMETER LIST

Common Name[1]	Appendix IX Parameters	CLP (TCL and Proposed TAL Parameters)
Acenaphthene	X	X
Acenaphthylene	X	X
Acetone	X	X
Acetophenone	X	
Acetonitraile; Methyl Cyanide	X	
2-Acetylaminofluorene; 2AAF	X	
Acrolein	X	
Acrylonitril	X	
Aldrin	X	X
Allyl Chloride	X	
4-Aminobiphenyl	X	
Aniline	X	
Anthracene	X	X
Antimony	X	X
Aramite	X	
Arsenic	X	X
Barium	X	
Benzene	X	X
Benzo{a}anthracene; Benzantracene	X	X
Benzo{b}fluoranthene	X	X
Benzo{k}fluoranthene	X	X
Benzoic Acid		X
Benzo{ghi}perylene	X	X
Benzo{a}pyrene	X	X
Benzyl alcohol	X	X
Beryllium	X	X
alpha-BHC	X	X
beta-BHC	X	X
delta-BHC	X	X
gamma-BHC; Lindane	X	X
Bis(2-chloroethoxy)methane	X	X
Bis(2-chloroethyl)ether	X	X
Bis(2-chloro-1methylethyl)ether; 2,2'-Dichlorodiisopropyl ether	X	X
Bis(2-ethylhexyl)phthalate	X	X-
Bromodichloromethane	X	X
Bromoform; Tribromomethane	X	X
4-Bromophenyl phenyl ether	X	X
Butyl benzyl phthalate; Benzyl butyl phthalate	X	X
Cadmium	X	X

TABLE 1 (Continued)

APPENDIX IX - PROPOSED CLP PARAMETER LIST

Common Name[1]	Appendix IX Parameters	CLP (TCL and Proposed TAL Parameters)
Carbon disulfide	X	X
Carbon tetrachloride	X	X
Chlordane	X	
alpha-Chlordane		X
gamma-Chlordane		X
p-Chloroaniline	X	X
Chlorobenzene	X	X
Chlorobenzilate	X	
p-Chloro-m-cresol	X	X
Chloroethane; Ethyl chloride	X	X
Chloroform	X	X
2-Chloronapthalene	X	X
2-Chlorophenol	X	X
4-Chlorophenyl phenyl ether	X	X
Chloroprene	X	
Chromium	X	X
Chrysene	X	X
Cobalt	X	
Copper	X	X
m-Cresol	X	
o-Cresol	X	X
p-Cresol	X	X
Cyanide	X	X
2,4-D; 2,4-Dichlorophenoxyacetic acid	X	
4-4'-DDD	X	X
4-4'-DDE	X	X
4-4'-DDT	X	X
Diallate	X	
Dibenz{a,h}anthracene	X	X
Dibenzofuran	X	X
Dibromochloromethane	X	X
1,2-Dibromo-3-chloropropane; DBCP	X	
1,2-Dibomoethane; Ethylene dibromide	X	
Di-n-butyl phthalate	X	X
o-Dichlorobenzene	X	X
m-Dichlorobenzene	X	X
p-Dichlorobenzene	X	X
3,3'-Dichlorobenzidine	X	X
trans-1,4-Dichloro-2-butene	X	
Dichlorodifluoromethane	X	
1,1-Dichloroethane	X	X
1,2-Dichlorothane; Ethylene dichloride	X	X

TABLE 1 (Continued)

APPENDIX IX - PROPOSED CLP PARAMETER LIST

Common Name[1]	Appendix IX Parameters	CLP (TCL and Proposed TAL Parameters)
1,1-Dichloroethylene; Vinylidene chloride	X	X
trans-1,2,-Dichloroethylene	X	
1,2-Dichloroethene (total)		X
2,4-Dichlorophenol	X	X
2,6-Dichlorophenol	X	
1,2-Dichloropropane	X	X
cis-1,3-Dichloropropene	X	X
trans-1,3-Dichloropropene	X	X
Dieldrin	X	X
Diethyl phthalate	X	X
O,O-Diethyl O-2-pyrazinyl	X	X
Phosphorothioate; Thionazin	X	
Dimethoate	X	
p-(Dimethylamino)azobenzene	X	
7,12-Dimethylbenz{a}anthracene	X	
3,3-Dimethylbenzidine	X	
alpha, alpha-dimethylphenethylamine	X	
2,4-Dimethyphenol	X	X
Dimethyl phthalate	X	X
2,4-Dimethyphenol	X	X
Dimethyl phthalate	X	X
m-Dinitrobenzene	X	
4,6-Dinitro-o-cresol	X	X
2,4-Dinitrophenol	X	X
2,4-Dinitrotoluene	X	X
2,6-Dinitrotoluene	X	X
Dinoseb; DNBP; 2-sec-Butyl-4,6-dinitrophenol	X	
Di-n-octyl phthalate	X	X
1,4-Dioxane	X	
Diphenylamine	X	
Disulfoton	X	
Endosulfan I	X	X
Endosulfan II	X	X
Endosulfan sulfate	X	X
Endrin	X	X
Endrin aldehyde	X	
Endrin ketone		X
Ethylbenzene	X	X
Ethyl methacrylate	X	

TABLE 1 (Continued)

APPENDIX IX - PROPOSED CLP PARAMETER LIST

Common Name[1]	Appendix IX Parameters	CLP (TCL and Proposed TAL Parameters)
Ethyl methanesulfonate	X	
Famphur	X	
Fluoranthene	X	X
Fluorene	X	X
Heptachlor	X	X
Heptachlor epoxide	X	X
Hexachlorobenzene	X	X
Hexachlorobutadiene	X	X
Hexachlorocyclopentadiene	X	X
Hexachloroethane	X	X
Hexachlorophene	X	
Hexachloropropene	X	
2-Hexanone	X	X
Indeno[1,2,3-od]pyrene	X	X
Isobutyl alcohol	X	
Isodrin	X	
Isophorone	X	X
Isosafrole	X	
Kepone	X	
Lead	X	X
Mercury	X	X
Methacrylonitrile	X	
Methapyrilene	X	
Methoxychlor	X	X
Methyl bromide: Bromomethane	X	
Methyl chloride: Chloromethane	X	X
3-Methylcholanthrene	X	
Methylene bromide: Dibromomethane	X	X
Methylene chloride: Dichloromethane	X	X
Methyl ethyl ketone; MEK	X	X
Methyl Iodide: Iodomethane	X	
Methyl methacrylate	X	
Methyl methanesulfonate	X	
2-Methylnaphthalene	X	X
Methyl parathion; Parathion methyl	X	
4-Methyl-2-pentanone; Methyl isobutyl ketone	X	X
Napthalene	X	X

TABLE 1 (Continued)

APPENDIX IX - PROPOSED CLP PARAMETER LIST

Common Name[1]	Appendix IX Parameters	CLP (TCL and Proposed TAL Parameters)
1,4-Napthoquinone	X	
1-Napththylamine	X	
2-Napthylamine	X	
Nickel	X	
o-Nitroaniline	X	X
m-Nitroaniline	X	X
p-Nitroaniline	X	X
Nitrobenzene	X	X
o-Nitrophenol	X	X
p-Nitrophenol	X	X
4-Nitroquinoline-1-oxide	X	
N-Nitrosodi-n-butylamine	X	
N-Nitrosodiethylamine	X	
N-Nitrosodimethylamine	X	
N-Nitrosodiphenylamine	X	X
N-Nitrosodipropylamine; Di-n-propyl-nitrosamine	X	X
N-Nitrosmethylethylamine	X	
N-Nitrosomorpholine	X	
N-Nitrosopiperidine	X	
N-Nitrosopyrrolldine	X	
5-Nitro-o-toluidine	X	
Parathion	X	
Polychlorinated biphenyls		
Aroclor 1016	X	X
Aroclor 1221	X	X
Aroclor 1232	X	X
Aroclor 1242	X	X
Aroclor 1248	X	X
Aroclor 1254	X	X
Aroclor 1260	X	X
Polychlorinated dibenzo-p-dioxins; PCDDs[2]	X	
Polychlorinated dibenzofurans; PCDFs[3]	X	
Pentachlorobenzene	X	
Pentachloroethane	X	
Pentachloronitrobenzene	X	
Pentachlorophenol	X	X
Phenacetin	X	
Phenanthrene	X	X
Phenol	X	X

TABLE 1 (Continued)

APPENDIX IX - PROPOSED CLP PARAMETER LIST

Common Name[1]	Appendix IX Parameters	CLP (TCL and Proposed TAL Parameters)
p-Phenylenediamine	X	
Phorate	X	
2-Picoline	X	
Pronamide	X	
Propionitrile; Ethyl cyanide	X	
Pyrene	X	X
Pyridine	X	
Safrole	X	
Selenium	X	X
Silver	X	X
Silvex; 2,4,5-TP	X	
Styrene	X	X
Sulfide	X	
2,4,5-T; 2,4,5-Trichlorophenoxyacetic acid	X	
1,2,4,5-Tetrachlorobenzene	X	
1,1,1,2-Tetrachloroethane	X	
Tetrachloroethylene; Perchloroethylene; Tetrachloroethene	X	X
2,3,4,6-Tetrachlorophenol	X	
Tetraethyl dithiopyrophosphate; Sulfotepp	X	
Thallium	X	X
Tin	X	
Toluene	X	X
o-Toluidine	X	
Toxaphene	X	X
1,2,4-Trichlorobenzene	X	X
1,1,1-Trichloroethane; Methylchloroform	X	X
1,1,2-Trichloroethane	X	X
Trichloroethylene; Trichloroethene	X	X
Trichlorofluoromethane	X	
2,4,5-Trichlorophenol	X	X
2,4,6-Trichlorophenol	X	X
1,2,3-Trichloropropane	X	
O,O,O-Triethyl phosphorothioate	X	
sym-Trinitrobenzene	X	
Vanadium	X	
Vinyl acetate	X	X
Vinyl chloride	X	X

TABLE 1 (Continued)

APPENDIX IX - PROPOSED CLP PARAMETER LIST

Common Name[1]	Appendix IX Parameters	CLP (TCL and Proposed TAL Parameters)
Xylene (total)	X	X
Zinc	X	X

NOTES:

1 Common names are those widely used in government regulations, scientific publications, and commerce; synonyms exist for many chemicals.

2 This category contains congener chemicals, including tetrachlorodibenzo-p-dioxins (see also 2,3,7,8-TCDD), pentachlorodibenzo-p-dioxins, and hexachlorodibenzo-p-dioxins. The PQL shown is an average value for PCDD congeners.

3 This category contains congener chemicals, including tetrachlorodibenzofurans, pentachlorodibenzofurans, and hexachlorodibenzofurans. the PQL shown in an average value for PCDF congeners.

ATTACHMENT A

DH-2 BORING LOG

3 4 0006644

SOIL & MATERIAL ENGINEERS, INC.

SOIL BORING AND WELL RECORD

Location: Olin McIntosh County: Washington Job No.: 071-077A Boring or Well No.: DH-2

Logged by: L. Carter Drilled by: Graves Grid Coord.: Lat.-Long.:

Date Started: 8-2-82 Boring Depth: 185' Static Water Level:

Date Completed: 8-9-82 Well Depth: 172 Permeability Tests:

Drilling Method: Rotary Casing: 6", 0-90 2", 0-100 Chemical Analysis: EPS Labs

Development Method: Air surge

Soil Samples: Cuttings Screen: 162 - 172

Geophysical Logs: G(S&ME) Grout and Seal: 0-154, 154-158

Depth Ft.	Elev.		Description
			See MP-4 log
	50		SAND: Light brown fine to medium with trace of very coarse sub-angular to sub-rounded quartzose slightly cherty slightly silty with fine black minerals clayey
	55		
			Tan and white very fine to fine with trace of very coarse sub-angular to sub-rounded quartzose slightly cherty silty with abundant very fine black minerals
	60		
			Tan white and yellow-brown very fine to very coarse sub-angular to sub-rounded quartzose cherty silty abundant very fine black minerals
	85		
			CLAY: Light gray with trace of brown mottling fine slightly sandy silty plastic very tight
	90		
	92		

3 4 00066.45

SOIL & MATERIAL ENGINEERS, INC.

SOIL BORING AND WELL RECORD

Location: Olin McIntosh County: Washington Job No.: 071-077A Boring or Well No.: DH-2

Logged by: L. Carter Drilled by: Graves Grid Coord.: Lat.-Long.:

Date Started: 8-2-82 Boring Depth: 185' Static Water Level:

Date Completed: 8-9-82 Well Depth: 172 Permeability Tests:

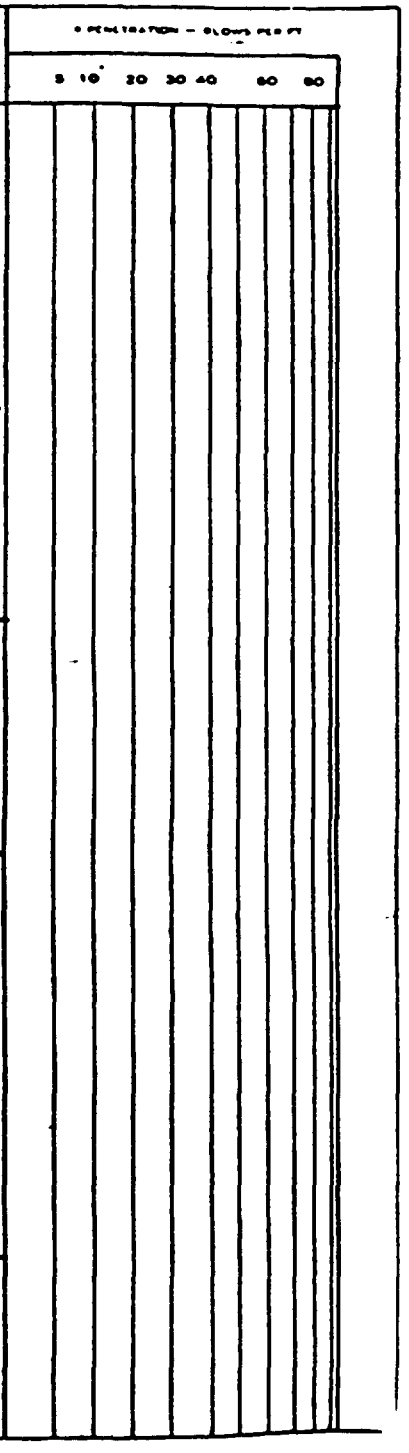
Drilling Method: Rotary Casing: 6", 0-90 2", 0-100 Chemical Analysis:

Development Method: Air surge

Soil Samples: Cuttings Screen: 162 - 172

Geophysical Logs: G(S&ME) Grout and Seal: 0-154, 154-158

Depth Ft.	Elev.	Description
	161	
	162	CLAY: Brown with some blue-gray fine slightly sandy silty plastic
	164	SAND: Brown very fine to fine with trace of medium sub-angular to sub-rounded quartzose silty slightly clayey
	168	CLAY: Blue-gray and brown mottled fine slightly sandy plastic
	172	
		Total Depth: 185'



ATTACHMENT B

EVALUATION OF MIOCENE GROUNDWATER FLOW

3 4 000668.47

DATE 4/25/91

PROJECT NO. 90 B 449 C

PAGE NO. 1 OF 1 BY MAS

Evaluation of Groundwater Flow in the Miocene

Attachment B

The effect of groundwater pumping from water production wells WW-8 and WW-10 on groundwater levels in the Miocene water-bearing zone was evaluated with the analytical groundwater model WELFLO (Walton, W.C., 1989, Analytical Groundwater Modeling, Lewis Publishers).

A rectangular area centered on the plant manufacturing area and extending 9000 feet in the east-west direction and 8500 feet in the north-south direction was modeled. The transmissivity of the Miocene was assigned to be 187,000 gallons per day per foot (gpd/ft) or 25,000 square feet per day (ft^2/day). The storativity was assigned to be 0.001. The aquifer properties were modeled as homogeneous and isotropic.

The pumping rate of the two wells (WW-8 and WW-10) was assigned to be 1000 gallons per minute (gpm) each. The magnitude of drawdown at locations spaced on 300-foot intervals was calculated after 30 days and 180 days of pumping.

The pumping of the water wells developed a broad cone of depression encompassing the entire plant area. After 30 days of pumping, drawdown at the far southeastern corner of the plant area (5000 feet southeast of WW-8) was predicted to be approximately 5.4 feet. The drawdown at this location was calculated to be 7.6 feet after 180 days of pumping. Therefore, the area of occurrence of constituents in the Citronelle Formation at the plant area lies within the area of the Miocene where groundwater flow is contained by the hydraulic effect of the water wells.

The drawdown values predicted by the model are attached.

GENERAL DATA BASE:

Number of simulation periods for which drawdown
or recovery is to be calculated 2
Simulation period number= 1
Duration of simulation period in days= 30.000
Simulation period number= 2
Duration of simulation period in days= 180.000
Number of grid columns= 30
Number of grid rows= 28
Grid spacing in ft= 300.00
X-coordinate of upper-left grid node in ft= 100.00
Y-coordinate of upper-left grid node in ft= 100.00
Simulation period number= 1
Number of production, injection, and image wells
active during simulation period= 2
Well number= 1
X-coordinate of well in ft= 2400.00
Y-coordinate of well in ft= 3200.00
Well discharge in gpm= 1000.00
Duration of pump operation during simulation period
in days= 30.000
Well radius in ft= 0.50
Simulation period number= 1
Number of production, injection, and image wells
active during simulation period= 2
Well number= 2
X-coordinate of well in ft= 3600.00
Y-coordinate of well in ft= 2600.00
Well discharge in gpm= 1000.00
Duration of pump operation during simulation period
in days= 30.000
Well radius in ft= 0.50
Simulation period number= 2
Number of production, injection, and image wells
active during simulation period= 2
Well number= 1
X-coordinate of well in ft= 2400.00
Y-coordinate of well in ft= 3200.00
Well discharge in gpm= 1000.00
Duration of pump operation during simulation period
in days= 180.000
Well radius in ft= 0.50
Simulation period number= 2

Number of productio jection, and image wells
active during simulation period= 2
Well number= 2
X-coordinate of well in ft= 3600.00
Y-coordinate of well in ft= 2600.00
Well discharge in gpm= 1000.00
Duration of pump operation during simulation period
in days= 180.000
Well radius in ft= 0.50
Number of observation wells for which time-
drawdown tables are desired 1
Observation well number= 1
I-coordinate of observation well= 20
J-coordinate of observation well= 22
Aquifer transmissivity in gpd/ft= 187000.00
Aquifer storativity as a decimal= 0.001000

NODAL COMPUTATION RESULTS:

SIMULATION PERIOD DURATION IN DAYS: 30.000

VALUES OF DRAWDOWN OR RECOVERY (FT) AT NODES:

J-ROW	I-COLUMN									
	1	2	3	4	5	6	7	8	9	10
1	5.67	5.79	5.92	6.04	6.15	6.26	6.35	6.43	6.49	6.53
2	5.79	5.93	6.07	6.21	6.34	6.46	6.57	6.67	6.74	6.79
3	5.92	6.07	6.23	6.39	6.54	6.68	6.81	6.93	7.02	7.08
4	6.04	6.21	6.39	6.57	6.74	6.91	7.07	7.21	7.33	7.41
5	6.16	6.35	6.54	6.75	6.95	7.16	7.35	7.52	7.67	7.78
6	6.26	6.47	6.70	6.93	7.17	7.41	7.64	7.86	8.04	8.19
7	6.36	6.59	6.84	7.10	7.38	7.67	7.95	8.22	8.46	8.65
8	6.44	6.69	6.96	7.26	7.58	7.93	8.29	8.62	8.91	9.15
9	6.50	6.76	7.06	7.39	7.76	8.18	8.64	9.08	9.41	9.63
10	6.53	6.81	7.12	7.47	7.89	8.39	8.99	9.67	10.06	10.04
11	6.54	6.82	7.13	7.50	7.94	8.48	9.23	10.46	11.27	10.26
12	6.52	6.79	7.10	7.46	7.88	8.40	9.09	10.07	10.56	9.94
13	6.47	6.73	7.02	7.35	7.73	8.17	8.67	9.16	9.39	9.28
14	6.39	6.64	6.90	7.20	7.52	7.86	8.21	8.51	8.66	8.66
15	6.30	6.52	6.76	7.01	7.28	7.55	7.80	8.00	8.12	8.14
16	6.19	6.39	6.60	6.82	7.04	7.25	7.44	7.59	7.68	7.71
17	6.07	6.25	6.43	6.62	6.80	6.97	7.12	7.23	7.31	7.33
18	5.94	6.10	6.26	6.42	6.57	6.71	6.83	6.93	6.98	7.01

19	5.81	5.95		6.23	6.36	6.48	6.57	6.65	6.70	6.72
20	5.68	5.81	5.93	6.05	6.16	6.26	6.34	6.40	6.44	6.46
21	5.55	5.66	5.77	5.87	5.97	6.05	6.12	6.18	6.21	6.23
22	5.42	5.52	5.62	5.71	5.79	5.86	5.92	5.97	6.00	6.01
23	5.29	5.38	5.47	5.55	5.62	5.69	5.74	5.78	5.80	5.82
24	5.17	5.25	5.33	5.40	5.46	5.52	5.57	5.60	5.62	5.63
25	5.05	5.13	5.19	5.26	5.31	5.36	5.40	5.43	5.45	5.46
26	4.94	5.00	5.07	5.12	5.17	5.22	5.25	5.28	5.30	5.31
27	4.83	4.89	4.94	4.99	5.04	5.08	5.11	5.13	5.15	5.16
28	4.72	4.77	4.82	4.87	4.91	4.94	4.97	5.00	5.01	5.02

J-ROW	I-COLUMN									
	11	12	13	14	15	16	17	18	19	20
1	6.54	6.53	6.50	6.44	6.36	6.26	6.15	6.03	5.90	5.77
2	6.81	6.80	6.76	6.69	6.59	6.47	6.34	6.20	6.05	5.90
3	7.11	7.10	7.05	6.96	6.84	6.70	6.54	6.37	6.21	6.04
4	7.45	7.44	7.38	7.27	7.12	6.94	6.75	6.55	6.36	6.17
5	7.84	7.83	7.76	7.62	7.42	7.19	6.96	6.73	6.51	6.29
6	8.29	8.30	8.21	8.02	7.75	7.46	7.17	6.90	6.64	6.41
7	8.81	8.89	8.78	8.48	8.10	7.71	7.36	7.04	6.76	6.50
8	9.41	9.67	9.59	9.03	8.43	7.93	7.52	7.16	6.85	6.57
9	9.94	10.70	11.03	9.51	8.67	8.08	7.61	7.23	6.90	6.62
10	10.13	10.56	10.56	9.48	8.68	8.10	7.63	7.25	6.92	6.63
11	9.96	9.86	9.61	9.07	8.50	8.00	7.58	7.21	6.89	6.61
12	9.57	9.32	9.03	8.66	8.24	7.83	7.46	7.13	6.83	6.56
13	9.06	8.83	8.58	8.28	7.95	7.62	7.31	7.01	6.74	6.49
14	8.55	8.38	8.17	7.93	7.67	7.40	7.13	6.87	6.63	6.40
15	8.08	7.96	7.80	7.61	7.40	7.17	6.94	6.72	6.50	6.30
16	7.67	7.59	7.46	7.31	7.13	6.95	6.75	6.56	6.37	6.18
17	7.31	7.25	7.15	7.03	6.89	6.73	6.56	6.39	6.22	6.05
18	6.99	6.95	6.87	6.77	6.65	6.52	6.38	6.23	6.08	5.93
19	6.71	6.67	6.61	6.53	6.43	6.32	6.19	6.06	5.93	5.80
20	6.45	6.43	6.38	6.31	6.22	6.13	6.02	5.91	5.79	5.67
21	6.22	6.20	6.16	6.10	6.03	5.94	5.85	5.75	5.65	5.54
22	6.01	5.99	5.96	5.91	5.84	5.77	5.69	5.60	5.51	5.41
23	5.81	5.80	5.77	5.73	5.67	5.61	5.54	5.46	5.38	5.29
24	5.63	5.62	5.59	5.56	5.51	5.45	5.39	5.32	5.25	5.17
25	5.46	5.45	5.43	5.40	5.36	5.31	5.25	5.19	5.12	5.05
26	5.30	5.29	5.27	5.25	5.21	5.17	5.12	5.06	5.00	4.93
27	5.16	5.15	5.13	5.10	5.07	5.03	4.99	4.94	4.88	4.82
28	5.02	5.01	4.99	4.97	4.94	4.91	4.87	4.82	4.77	4.72

J-ROW	I-COLUMN									
	21	22	23	24	25	26	27	28	29	30

1	5.64	5.51	5.38	5.25	5.13	5.01	4.89	4.78	4.67	4.57
2	5.76	5.61	5.47	5.34	5.21	5.08	4.96	4.84	4.73	4.62
3	5.88	5.72	5.57	5.42	5.28	5.14	5.02	4.89	4.77	4.66
4	5.99	5.82	5.65	5.49	5.35	5.20	5.07	4.94	4.82	4.70
5	6.09	5.91	5.73	5.56	5.41	5.26	5.12	4.98	4.86	4.74
6	6.19	5.99	5.80	5.62	5.46	5.30	5.16	5.02	4.89	4.76
7	6.27	6.05	5.85	5.67	5.50	5.34	5.19	5.05	4.91	4.79
8	6.32	6.10	5.89	5.71	5.53	5.37	5.21	5.07	4.93	4.81
9	6.36	6.13	5.92	5.73	5.55	5.38	5.23	5.08	4.95	4.82
10	6.37	6.14	5.93	5.74	5.56	5.39	5.23	5.09	4.95	4.82
11	6.36	6.13	5.92	5.73	5.55	5.38	5.23	5.08	4.95	4.82
12	6.32	6.10	5.90	5.71	5.53	5.37	5.22	5.07	4.94	4.81
13	6.26	6.05	5.86	5.67	5.50	5.34	5.19	5.05	4.92	4.79
14	6.19	5.99	5.80	5.63	5.46	5.31	5.16	5.03	4.90	4.77
15	6.10	5.91	5.74	5.57	5.42	5.27	5.13	4.99	4.87	4.74
16	6.00	5.83	5.66	5.51	5.36	5.22	5.08	4.95	4.83	4.71
17	5.89	5.73	5.58	5.43	5.29	5.16	5.03	4.91	4.79	4.67
18	5.78	5.63	5.49	5.36	5.22	5.10	4.97	4.86	4.74	4.63
19	5.66	5.53	5.40	5.27	5.15	5.03	4.91	4.80	4.69	4.59
20	5.55	5.42	5.30	5.19	5.07	4.96	4.85	4.74	4.64	4.54
21	5.43	5.32	5.21	5.10	4.99	4.88	4.78	4.68	4.58	4.48
22	5.31	5.21	5.11	5.01	4.91	4.81	4.71	4.62	4.52	4.43
23	5.20	5.10	5.01	4.92	4.82	4.73	4.64	4.55	4.46	4.37
24	5.08	5.00	4.91	4.83	4.74	4.65	4.57	4.48	4.40	4.31
25	4.97	4.90	4.82	4.74	4.66	4.57	4.49	4.41	4.33	4.25
26	4.87	4.79	4.72	4.65	4.57	4.50	4.42	4.34	4.27	4.19
27	4.76	4.70	4.63	4.56	4.49	4.42	4.35	4.27	4.20	4.13
28	4.66	4.60	4.54	4.47	4.41	4.34	4.27	4.21	4.14	4.07

NODAL COMPUTATION RESULTS:

SIMULATION PERIOD DURATION IN DAYS: 180.000

VALUES OF DRAWDOWN OR RECOVERY (FT) AT NODES:

J-ROW	I-COLUMN									
	1	2	3	4	5	6	7	8	9	10
1	7.86	7.99	8.11	8.23	8.34	8.45	8.54	8.62	8.68	8.72
2	7.99	8.13	8.26	8.40	8.53	8.66	8.77	8.86	8.94	8.99
3	8.11	8.27	8.42	8.58	8.73	8.88	9.01	9.12	9.21	9.28
4	8.23	8.40	8.58	8.76	8.94	9.11	9.27	9.41	9.52	9.60
5	8.35	8.54	8.74	8.94	9.15	9.35	9.54	9.72	9.86	9.97

6	8.46	8.67		9.12	9.36	9.60	9.84	10.05	10.24	10.39
7	8.55	8.78	9.03	9.29	9.57	9.86	10.15	10.42	10.65	10.85
8	8.63	8.88	9.15	9.45	9.78	10.13	10.48	10.82	11.10	11.35
9	8.69	8.96	9.25	9.58	9.95	10.38	10.83	11.28	11.60	11.83
10	8.73	9.00	9.31	9.67	10.08	10.58	11.19	11.86	12.25	12.24
11	8.73	9.01	9.33	9.69	10.13	10.68	11.43	12.65	13.47	12.46
12	8.71	8.98	9.29	9.65	10.07	10.60	11.29	12.26	12.76	12.14
13	8.66	8.92	9.21	9.54	9.92	10.36	10.86	11.35	11.59	11.47
14	8.59	8.83	9.10	9.39	9.71	10.06	10.41	10.70	10.86	10.85
15	8.49	8.71	8.95	9.21	9.47	9.74	9.99	10.20	10.32	10.34
16	8.38	8.58	8.79	9.01	9.23	9.44	9.63	9.78	9.87	9.90
17	8.26	8.44	8.62	8.81	8.99	9.16	9.31	9.43	9.50	9.53
18	8.13	8.29	8.45	8.61	8.77	8.91	9.03	9.12	9.18	9.20
19	8.00	8.14	8.28	8.42	8.55	8.67	8.77	8.84	8.89	8.91
20	7.87	8.00	8.12	8.24	8.35	8.45	8.53	8.59	8.64	8.65
21	7.74	7.85	7.96	8.06	8.16	8.24	8.31	8.37	8.40	8.42
22	7.61	7.71	7.81	7.90	7.98	8.05	8.11	8.16	8.19	8.20
23	7.48	7.57	7.66	7.74	7.81	7.88	7.93	7.97	7.99	8.01
24	7.36	7.44	7.52	7.59	7.65	7.71	7.76	7.79	7.81	7.82
25	7.24	7.31	7.38	7.45	7.50	7.55	7.59	7.62	7.64	7.65
26	7.12	7.19	7.25	7.31	7.36	7.40	7.44	7.47	7.49	7.49
27	7.01	7.07	7.13	7.18	7.22	7.26	7.30	7.32	7.34	7.34
28	6.90	6.96	7.01	7.05	7.10	7.13	7.16	7.18	7.20	7.20

J-ROW	I-COLUMN									
	11	12	13	14	15	16	17	18	19	20
1	8.74	8.73	8.69	8.63	8.55	8.45	8.34	8.22	8.09	7.96
2	9.01	9.00	8.95	8.88	8.78	8.66	8.53	8.39	8.24	8.09
3	9.31	9.29	9.24	9.16	9.04	8.89	8.73	8.57	8.40	8.23
4	9.64	9.64	9.57	9.46	9.31	9.13	8.94	8.74	8.55	8.36
5	10.03	10.03	9.95	9.81	9.61	9.39	9.15	8.92	8.70	8.49
6	10.48	10.50	10.41	10.21	9.94	9.65	9.36	9.09	8.83	8.60
7	11.01	11.08	10.98	10.68	10.29	9.91	9.55	9.24	8.95	8.69
8	11.60	11.86	11.78	11.22	10.63	10.13	9.71	9.35	9.04	8.77
9	12.14	12.89	13.22	11.70	10.86	10.27	9.81	9.42	9.10	8.81
10	12.32	12.76	12.76	11.67	10.88	10.29	9.83	9.44	9.11	8.82
11	12.15	12.05	11.80	11.27	10.70	10.20	9.77	9.41	9.09	8.80
12	11.76	11.51	11.23	10.85	10.43	10.03	9.66	9.32	9.03	8.76
13	11.25	11.03	10.77	10.48	10.15	9.82	9.50	9.21	8.94	8.69
14	10.74	10.57	10.37	10.13	9.87	9.59	9.33	9.07	8.82	8.59
15	10.28	10.16	10.00	9.81	9.59	9.37	9.14	8.91	8.70	8.49
16	9.87	9.78	9.66	9.50	9.33	9.14	8.95	8.75	8.56	8.37
17	9.51	9.44	9.35	9.22	9.08	8.92	8.76	8.59	8.41	8.25
18	9.19	9.14	9.06	8.96	8.84	8.71	8.57	8.42	8.27	8.12

19	8.90	8.87	[illegible]	8.72	8.62	8.51	8.39	8.26	8.12	7.99
20	8.65	8.62	8.57	8.50	8.41	8.32	8.21	8.10	7.98	7.86
21	8.41	8.39	8.35	8.29	8.22	8.14	8.04	7.94	7.84	7.73
22	8.20	8.18	8.15	8.10	8.04	7.96	7.88	7.79	7.70	7.60
23	8.00	7.99	7.96	7.92	7.86	7.80	7.73	7.65	7.56	7.48
24	7.82	7.81	7.78	7.75	7.70	7.64	7.58	7.51	7.43	7.35
25	7.65	7.64	7.62	7.59	7.54	7.49	7.44	7.38	7.31	7.24
26	7.49	7.48	7.46	7.43	7.40	7.35	7.30	7.25	7.19	7.12
27	7.34	7.33	7.32	7.29	7.26	7.22	7.17	7.12	7.07	7.01
28	7.20	7.19	7.18	7.16	7.13	7.09	7.05	7.00	6.95	6.90

J-ROW				I-COLUMN						
	21	22	23	24	25	26	27	28	29	30
1	7.83	7.69	7.57	7.44	7.32	7.20	7.08	6.97	6.86	6.75
2	7.95	7.80	7.66	7.53	7.39	7.27	7.14	7.02	6.91	6.80
3	8.07	7.91	7.75	7.61	7.47	7.33	7.20	7.08	6.96	6.84
4	8.18	8.01	7.84	7.68	7.53	7.39	7.26	7.13	7.00	6.88
5	8.29	8.10	7.92	7.75	7.59	7.45	7.30	7.17	7.04	6.92
6	8.38	8.18	7.99	7.81	7.65	7.49	7.34	7.21	7.07	6.95
7	8.46	8.24	8.04	7.86	7.69	7.53	7.38	7.23	7.10	6.97
8	8.52	8.29	8.09	7.90	7.72	7.56	7.40	7.26	7.12	6.99
9	8.55	8.32	8.11	7.92	7.74	7.57	7.42	7.27	7.13	7.00
10	8.56	8.33	8.12	7.93	7.75	7.58	7.42	7.27	7.14	7.00
11	8.55	8.32	8.11	7.92	7.74	7.57	7.42	7.27	7.13	7.00
12	8.51	8.29	8.09	7.90	7.72	7.56	7.40	7.26	7.12	6.99
13	8.46	8.24	8.05	7.86	7.69	7.53	7.38	7.24	7.11	6.98
14	8.38	8.18	7.99	7.82	7.65	7.50	7.35	7.21	7.08	6.96
15	8.29	8.10	7.93	7.76	7.60	7.45	7.31	7.18	7.05	6.93
16	8.19	8.02	7.85	7.70	7.55	7.40	7.27	7.14	7.01	6.90
17	8.08	7.92	7.77	7.62	7.48	7.35	7.22	7.09	6.97	6.86
18	7.97	7.82	7.68	7.54	7.41	7.28	7.16	7.04	6.93	6.81
19	7.85	7.72	7.59	7.46	7.34	7.22	7.10	6.98	6.87	6.77
20	7.74	7.61	7.49	7.37	7.26	7.14	7.03	6.93	6.82	6.72
21	7.62	7.51	7.40	7.29	7.18	7.07	6.97	6.86	6.76	6.67
22	7.50	7.40	7.30	7.19	7.09	6.99	6.89	6.80	6.70	6.61
23	7.39	7.29	7.20	7.10	7.01	6.92	6.82	6.73	6.64	6.55
24	7.27	7.19	7.10	7.01	6.92	6.84	6.75	6.66	6.58	6.49
25	7.16	7.08	7.00	6.92	6.84	6.76	6.67	6.59	6.51	6.43
26	7.05	6.98	6.91	6.83	6.75	6.68	6.60	6.52	6.45	6.37
27	6.94	6.88	6.81	6.74	6.67	6.60	6.53	6.45	6.38	6.31
28	6.84	6.78	6.72	6.65	6.59	6.52	6.45	6.38	6.31	6.25

Don Hunter continuation

3 4 0006854

DATE 4/24/91

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30
160

Olin McIntosh

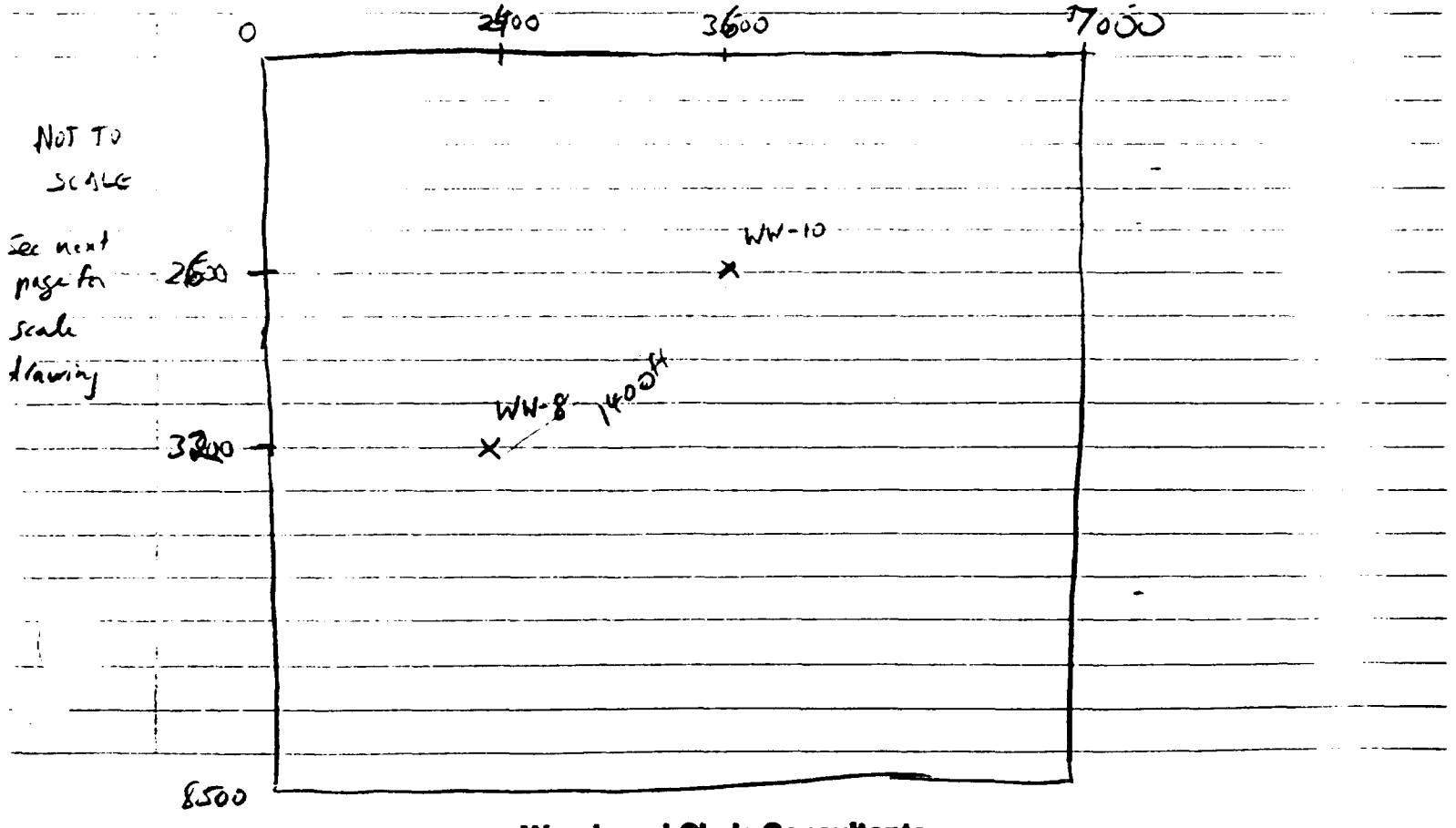
Calculate (with WELFLO – analytical model by Walton for Theis solution) drawdown due to 2 wells WW-8 (?) and WW-10 at north side of plant.

Evaluate drawdown over area from

2500 ft N of WW 10 to 6000 ft S of WW-10

3500 ft W of WW 10 to 3500 ft E of WW-10

(upper left corner of area is 4500 ft NW of WW-10 – is origin of coordinate system



Woodward-Clyde Consultants

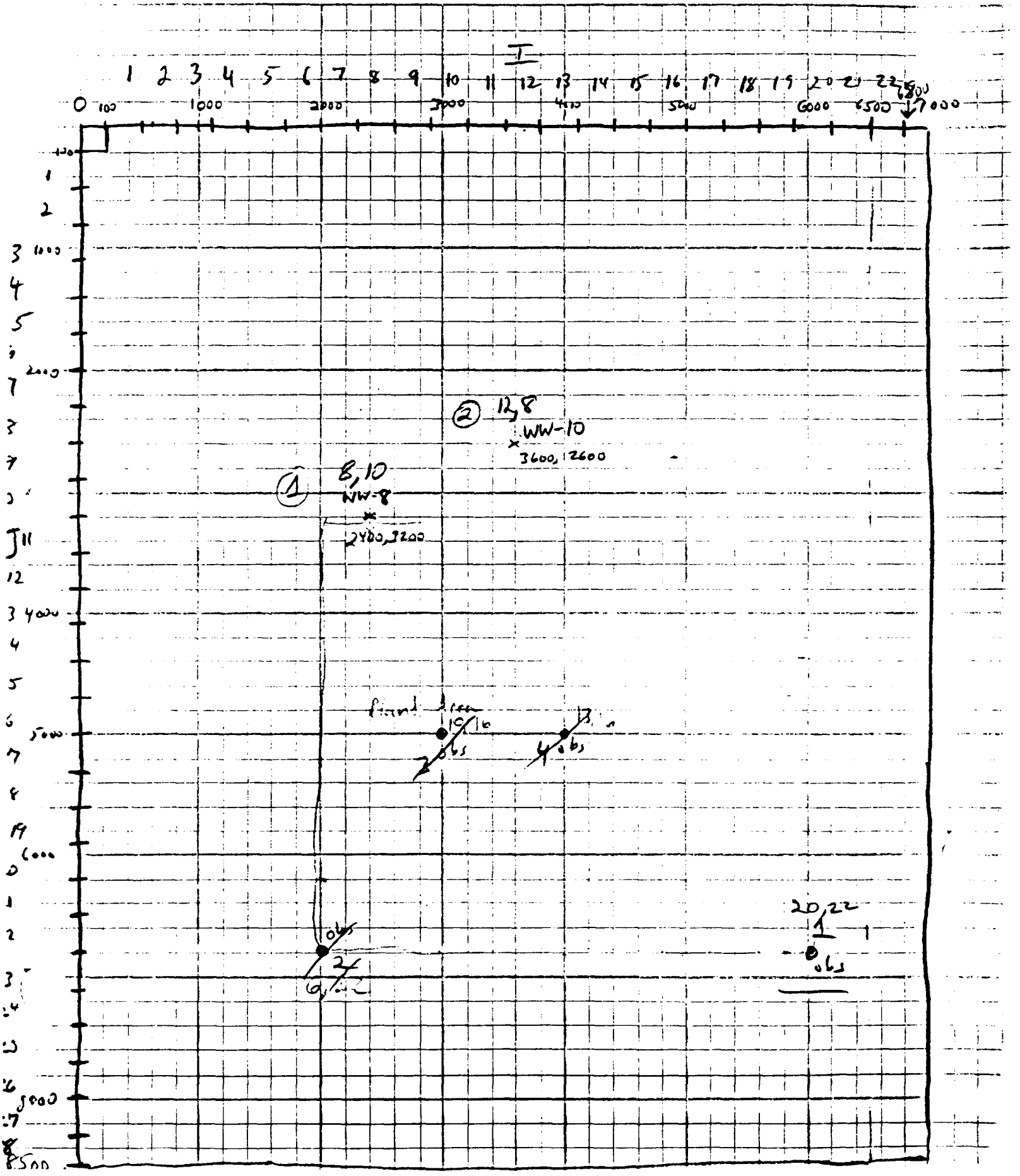
3 4 00068 55 Sheet No. 2 Of 4

File 90B449C

FOR Olin McIntosh

Made by MAB Date 4/24/91

Checked by _____ Date _____



3 4 0006856

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Simulate drawdown at

30

60

90

120

180 days 5th time

1 obs pt (see map) for table 1 drawdown vs. time — at far southeastern corner area of PL9D (farthest extent of plume)

T of aquifer

25,000 ft^2/day 7.48 $\frac{gal}{ft^3}$

converted to gpd/ft

T = 187,000 gpd/ft

S = 0.001 (guess)

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Obs pt 20,22 (at PL9D)

Days	Drawdown (ft)
30	5.41
60	6.26
90	6.75
120	7.10
180	7.60

this pt is near boundary

Run 2 extend eastern boundary

to 30 columns 8 × 300 = 2400 ft

to 9200 ft

calculate for 180 days only

save as = OL 180 D2

180 day 7.60 ft drawdown

no change from previous run